



Newsletter

Volume 4, Number 4
July - August 1987

At the Arboretum ...

Work on a "Pollution Garden", the second IES Research Display, has been in progress since late spring. This living display shows the effects of air pollution on sensitive and resistant plants.

The Fall Adult Education Program brings new courses, workshops and excursions. See our catalogue!

Sunday Ecology Programs are held on the first and third Sunday of each month (except holiday weekends).

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See the Summer/Fall Calendar on the last page of this Newsletter for information on all of our current public programs.

The IES Newsletter is published by the Institute of Ecosystem Studies at the Mary Flagler Cary Arboretum. Located in Millbrook, New York, the Institute is a division of The New York Botanical Garden. All newsletter correspondence should be addressed to the Editor.

Gene E. Likens, Director
Joseph S. Warner, Administrator
Alan R. Berkowitz,
Head of Education

Editor: Jill Cadwallader
Design and Printing: Central Press

INSTITUTE OF
ECOSYSTEM STUDIES
The New York Botanical Garden
Mary Flagler Cary Arboretum
Box AB
Millbrook, NY 12545
(914) 677-5343

International Ecology Conference

Ecologists are increasingly aware of the importance of long-term studies in gaining a better understanding of ecological phenomena. On May 10th, 1987, sixty-one eminent ecologists from eleven nations gathered at the Institute of Ecosystem Studies for the Institute's second Cary Conference. By the closing session on May 13th, this body of scientists had endorsed a far-reaching statement of the need for sustained ecological research.

The importance of long-term studies to society becomes clear when one looks at current problems. For example:

- * Acid rain in North America was identified by IES Director Dr. Gene E. Likens and colleagues in the course of their long-term research at the Hubbard Brook Experimental Forest in New Hampshire.
- * Long-term studies demonstrated that

continued use of ammonium fertilizers had the detrimental effect of acidifying soil.

- * Have you wondered what the benefits are from using unleaded gasoline in cars? Long-term research has demonstrated declining concentrations of lead in the environment following the reduction in use of leaded gasoline.
- * Detection of the "greenhouse effect", a phenomenon caused by gradual changes in the amount of carbon dioxide in the atmosphere, was possible only through observation over long periods of time.
- * The consequences of the introduction of a new animal species into an area -- such as the gradual movement of the Lyme tick outwards from its point of discovery along the New England shore -- is best understood by doing careful measurements year after year.

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Perennial Garden Dedicated

For several years, visitors to the Mary Flagler Cary Arboretum have watched the development of the Perennial Garden, located at the Gifford House Visitor and Education Center. On June 27th, 175 Arboretum members and friends attended a ceremony to formally dedicate this public garden.

Speakers at the dedication were Dr. Gene E. Likens, Director of the Institute of Ecosystem Studies and of the Arboretum; Dutchess County Legislator Ann L. Loedy; Town of Washington Supervisor Augustine Rotunno; Millbrook Mayor

Michael Murphy; Oakleigh B. Thorne, the Chairman of the Perennial Garden Committee; and Bradley H. Roeller, manager of the Arboretum's display gardens. During a champagne reception following the ceremony, guests were invited to tour the Garden with the Arboretum's horticultural staff, to learn about its history as well as about the numerous plantings.

The new Perennial Garden demonstrates the relationship between good horticulture and sound ecology. Knowledge of the

continued on page 4



Oakleigh Thorne, Gene Likens and Ann Loedy at the Perennial Garden dedication ceremonies.

When Animals Eat Rocks

Snails typically feed using teeth adapted for scraping material off a surface. Snails in the Negev Desert are proving to be not at all typical, however, in that they eat plants living **beneath** the surfaces of rocks. Moreover, recent studies show that this very unusual form of herbivory is weathering the desert at a significant rate.



JILL GADWALLER

Using a "snail simulator" -- an electric engraving tool -- Dr. Moshe Shachak will scrape away the top layer of a limestone rock. The resulting material, identical to the material that snails are eating, will be chemically analyzed by Dr. Clive Jones (standing).

The Negev Desert Highlands in southern Israel provides a harsh climate for its few resident animals and plants. Rainfall is slight -- 3.5 inches a year -- and seventy percent of the area is covered with limestone rocks. Each rock is a miniature ecosystem: abiotic substrate (rock), herbivores (snails) and a plant community (lichens). Lichens are really two organisms -- an alga and a fungus -- in a symbiotic relationship. Epilithic lichens live on the surface of a substrate such as a rock or tree, while endolithic lichens -- typical of harsh tundra, alpine and desert environments -- live beneath the rock surface. In this ecosystem the snail eats endolithic lichens, and, while doing so, has to eat the rock as well. Eating rock is a form of biological weathering, and, on the hillsides of the

Negev Desert, soils are produced more rapidly by this means than by deposition of wind-borne particles -- one way in which soils are typically formed.

Research on this tiny ecosystem began when Dr. Moshe Shachak¹, in collaboration with IES Chemical Ecologist Dr. Clive Jones, observed two species of the snail genus *Euchondrus* foraging on limestone rocks in the Negev Desert. These rocks were "home" to large numbers of both epilithic and endolithic lichens. Close examination of the foraging areas showed trails -- actual gouges in the rock -- apparently made by the snails. The white color of the exposed limestone indicated that the lichens beneath the surface elsewhere in the rock were gone from these feeding areas. Chemical analysis showed that the snails' feces, which were also white, had virtually the same calcium content as the surface layer of rocks on which they browsed (calcium carbonate is the major component of limestone rocks).

Experimentation was done in the Negev Desert, both in the field and in outdoor enclosures, to determine the rate of rock removal. Snails in the field, at densities of less than one per rock, ate at a rate which resulted in a disappearance of 4% of the rock surface (to a depth of about 1 mm) over the course of a year. In the enclosures the ecologists estimated that 7% of the rock surface was removed in a year. Based on the estimates of the annual grazing rates in the field and in the enclosure, they calculated that the snails were turning rock into soil at a rate of approximately 1.89 to 3 tons per acre each year.

Perhaps this figure can be brought closer to home by picturing a snail at human proportions. This giant snail -- your size! -- would need to eat something close to 2.8 pounds of rock per meal to gain sufficient nutrition from the resident population of endolithic lichens.

It is an understatement to say that these figures are impressive, but the best way to test their significance is to compare them with what was generally considered to be the main source of soil in the dessert: dust deposition from wind. By measuring the total dust deposition on stones in the same area as the biological weathering was occurring, Drs. Shachak and Jones estimated a rate of approximately 0.98 tons per acre per year, which is essentially one half to one

third of the rate at which the snails form new soil by eating lichen and rock!

The Negev Desert snails are not lichen gluttons. However, because lichens are low in nutrient value, the snails must eat a large amount of rock to find enough plant material to survive. Observations in this snail/lichen/rock ecosystem study have demonstrated that herbivores -- even those that consume relatively small amounts of plant material -- can play a far more significant role in the processes occurring in an ecosystem than had been thought previously.



ROBERT MICKLER

Snails and their trails.

* * * * *

This research was reported in the May 29th issue of the prestigious scientific journal, SCIENCE (Vol. 236, pp. 1098-1099). The featured paper, by Moshe Shachak, Clive Jones and Yigal Granot, is entitled "Herbivory in Rocks and the Weathering of a Desert".

¹ Dr. Shachak has visited the Institute of Ecosystem Studies to collaborate on ecosystem research three times since 1984, most recently in September 1986. He is a senior investigator at The Jacob Blaustein Institute for Desert Research, Ben-Gurion University of the Negev in Israel. Funding for Dr. Shachak's research at IES was provided by the Mary Flagler Cary Charitable Trust

New Staff



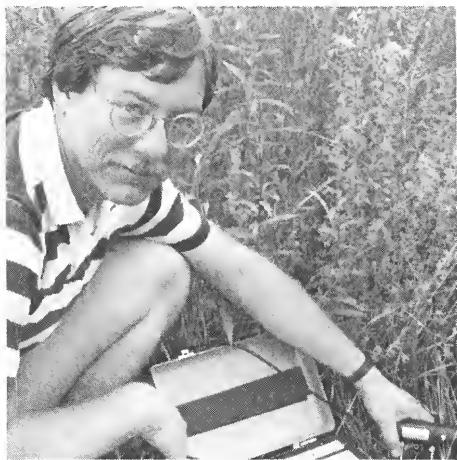
SHARLFISON

CAROLE ANNE CORRADO, research assistant I, is working for Laboratory Manager John Eaton. A graduate of the State University of New York at Plattsburgh with a bachelor's degree in biology and chemistry, her responsibilities at IES include the inorganic analysis of Hubbard Brook Ecosystem Study samples.



MARICA STEVENS

DAVID M. WOOD, postdoctoral associate, is working with IES Plant Ecologist Dr. Charles Canham. As the Right-of-Way Project coordinator, Dr. Wood supervises field experiments and analyzes resulting data. Dr. Wood's Ph.D. research at the University of Washington in Seattle dealt with primary succession in high elevation habitats on Mount St. Helens.



SHARLFISON

EDWARD A. ROY, left, is forest manager at The New York Botanical Garden in the Bronx. Supervised by IES Terrestrial Ecologist Dr. Mark McDonnell, Mr. Roy is responsible for coordinating the scientific and management activities in the NYBG Forest. His current emphasis is trail restoration and replacement of signs, and coordination of activities at the Lucy Moses Overlook. He also assists Dr. McDonnell with studies of sixteen permanent plots in the Forest. Mr. Roy has a bachelor of science degree in botany and plant pathology from the University of New Hampshire.

Shoemaker Recognized

David R. Shoemaker, an IES summer project assistant in 1985 and 1986, is the recipient of the 1987 P.F. English Memorial Award. This award is presented annually by The Northeast Section, The Wildlife Society, to the outstanding undergraduate student of wildlife biology or wildlife management in the region.

Mr. Shoemaker graduated in May from Unity College in Maine with a bachelor of science degree in wildlife ecology. Throughout his college career he was actively involved in a variety of research projects, including Lyme tick and deer repellent studies with IES wildlife ecologists. He is beginning his Ph.D. work this summer in the Cooperative Wildlife Research Laboratory at Southern Illinois University.



MIKE FARGIONE

IES Wildlife Ecologist Jay McAninch (left), current president of The Northeast Section, The Wildlife Society, and award recipient David Shoemaker.

Mr. Shoemaker was honored at the Northeast Fish and Wildlife Conference banquet held on May 5th in Boston. The purpose of the P.F. English Award is to acknowledge and encourage exceptional students, and to perpetuate the memory of Dr. English, an outstanding educator in the field of wildlife management.

Research Support

A gift of \$100,000 has been received from the charitable trust created by the will of Mrs. Marilyn M. Simpson. This bequest will support research being done by Institute of Ecosystem Studies scientists.

The trustees' decision was based on the similarity between Mrs. Simpson's interests and those of the IES research program. A resident of Katonah, New York, Mrs. Simpson was very much at home in the out-of-doors and was especially interested in ecological and environmental issues of the Hudson Valley area.

Conference ... from page 1

While ecologists themselves are aware of the importance of these studies, there is still a need for increased awareness by public officials and others. Cary Conference participants were asked to consider the topic "Long-Term Studies in Ecology: Approaches and Alternatives". The goal was to bring sustained ecological research more to the forefront of current scientific investigation.

At the final session, Dr. Likens introduced a draft statement prepared by a group of participants requesting a commitment to sustained ecological research and a new partnership between scientists and resource managers ... groups with common long-term goals. The conferees gave the draft unanimous endorsement.

In his closing remarks, Dr. Likens stated his pleasure at the decisions that were reached and reemphasized the importance of sustained ecological research. "The collection of long-term data will help solve some of our major environmental problems on this planet; if we are unable to solve these problems, the quality of life will be reduced." Pointing out that the time is favorable now to promote and do long-term ecological research, he urged participants to "grasp these opportunities and make them work to the betterment of humankind!"

* * * * *

The 1987 Cary Conference was the second such meeting organized at the Institute of Ecosystem Studies. In May 1985, participants met to consider the "Status and Future of Ecosystem Science". These conferences were supported by the Mary Flagler Cary Charitable Trust and the National Science Foundation. Proceedings of the first conference are available in a report just published by IES. Proceedings of the second conference will be published as a book edited by Dr. Likens.

Dedication ... from page 1

ecological principles of plant adaptation and persistence is combined with the best in horticultural design. The result: a model of low-maintenance garden beauty, appropriate for the Arboretum as home of the Institute of Ecosystem Studies. The garden boasts over 4500 plants representing 800 different species and/or cultivars, and is therefore one of the largest collections of herbaceous perennials to be seen in any public garden in the northeastern United States.

Designed by Robert S. Hebb, former Arboretum horticulturist, and Carlton B. Lees, retired senior vice president of horticulture at The New York Botanical Garden, the garden was constructed by Arboretum staff under Mr. Roeller's supervision. Support for the work was provided by matching grants from the Millbrook Tribune Garden, Inc. and the McCann Foundation, as well as by generous gifts from members of the local community.

A special Perennial Garden brochure was prepared by former IES intern Collin Harty. This brochure, which includes a map of the plantings, is free to all Arboretum visitors to increase their enjoyment of the garden. The garden is open to the public during Arboretum hours, with a free access permit from the Gifford House.

Summer/Fall Calendar

COURSES

Fall Adult Education Program courses in landscape design, gardening and botany will begin in mid-September:

- Landscape Design Theory
- Graphics
- Landscape Design III: Planting Design
- Construction II: Site Detailing
- Surveying for Landscape Design
- Fundamentals of Gardening
- Soil Science
- Plant Propagation and Grafting
- Commercial Greenhouse Management
- Basic Botany

Special Workshops

- Oct. 7th -- Airphoto Interpretation and Land Use:
An Introduction to Basic Techniques
- Oct. 31st -- Landscape Site Plans: Interpretation and Review
- Nov. 14th -- Landscape Preservation: Ecological and Social Issues

If you would like to receive a catalogue and are not already on our mailing list, call the Gifford House at the number below.

FALL ECOLOGICAL EXCURSIONS

Join us for one or more of the following day trips:

- Estuarine Ecology: Canoe Exploration of Constitution Marsh
- Catskill Mountain Ecosystems
- Hudson River Ecology Cruise on the Sloop Clearwater
- Agricultural Ecology of the Mid-Hudson Valley

For details and registration information, call the number below.

SUNDAY ECOLOGY PROGRAMS

Free public programs are offered on the first and third Sunday of each month. All programs are from one to two hours long, and begin at 2:00 pm at the Gifford House unless otherwise noted. (There will not be a Sunday Program on the Labor Day weekend.)

Tentative schedule (please call (914) 677-5358 to confirm the day's topic):

- Sept. 20th: Pond ecology ... another perspective
(Michael Pace) - Walk
- Oct. 4th: How do old fields turn into forests?
(Steward Pickett) - Walk
- Oct. 18th: The secret life of soils (Alan Berkowitz) - Walk
- Nov. 1st: Topic to be announced
- Nov. 15th: Air pollution and the forest
(Gary Lovett) - Walk

For more information, call (914) 677-5359 weekdays from 8:30 - 4:30.

For ecology walks, wear long pants and sturdy footwear with socks; long-sleeved shirts or jackets are also recommended. In case of inclement weather, call (914) 677-5358 after 1 pm to learn the status of the day's program.

RESEARCH DISPLAYS

IES is setting up displays to introduce Arboretum visitors to the methods and thinking behind ongoing ecological research projects. The first of these to be completed is "Acid Rain Study Ponds", behind the Gifford House. Here, a series of tanks simulating natural ponds (complete with plants and animals) are exposed to different chemical treatments and the results recorded twice a week. This free demonstration is open to the public during Arboretum hours through October; children must be accompanied by an adult. An IES staff scientist will give special programs to groups that call the number below for an appointment.

GREENHOUSE

The IES Greenhouse performs double-duty: it is a year-round tropical-plant paradise as well as a site for controlled environmental research. The public is invited to explore both aspects during Arboretum hours. There is no admission fee, but visitors should first stop at the Gifford House (see below).

SCIENTIFIC SEMINARS

The Institute's weekly program of scientific seminars will resume in September. This program features presentations by visiting scientists or Institute staff. All seminars take place in the Plant Science Building on Fridays at 3:30 p.m. Admission is free. For a schedule, contact Julie Morgan at (914) 677-5343.

ARBORETUM HOURS

Monday through Saturday, 9 a.m. to 4 p.m.; Sunday 1 - 4 p.m. The Gift and Plant Shops are open Tuesday through Saturday 11 a.m. to 4 p.m.; Sunday 1 - 4 p.m. Closed on public holidays. All visitors must obtain a free permit at the Gifford House for access to the Arboretum.

MEMBERSHIP

Take out a membership in the Mary Flagler Cary Arboretum. Benefits include a special member's rate for IES courses and excursions, a 10% discount on purchases from the Gift Shop, six issues of the IES Newsletter each year, free subscription to *Garden* (the beautifully illustrated magazine for the enterprising and inquisitive gardener), and parking privileges and free admission to the Enid A. Haupt Conservatory at The New York Botanical Garden in the Bronx. Individual membership is \$25; family membership is \$35. For information on memberships, contact Janice Claiborne at (914) 677-5343.

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